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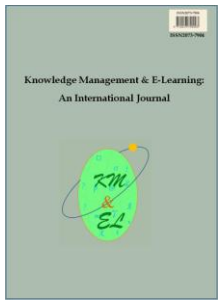

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Concept maps which visualise the artifice of teaching sequence: Cognition, linguistic and problem-based views on a common teaching problem

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Abstract: This paper is concerned with the ways in which undergraduates are first introduced to Law of Contract in a University Law School. Concept mapping is used to document students' changing understanding in the course of one first year undergraduate module. Forty seven students (the members of four tutorial groups) made concept maps of "*Law of Contract"* at the start and at the finish of a twenty-four week study-programme and their maps were compared with two other concept maps made by their lecturer: 1) a map of the teaching sequence; 2) a map of the practices of Law of Contract. The analysis shows how the teaching *sequence* inscribes itself upon the students' concept mapping structures even while this temporal pattern has little (or no) genuine accord with the knowledge-shape of legal analysis. The paper explores two different approaches to concept map analysis: First the more traditional perspective of cognition (and cognitive-structure); second the "linguistic-turn". Both of these highlight the "artifice of teaching sequence" but they locate this problem in different arenas. While the cognitive approach suggests that the problem is a general issue of student learning quality, the linguistic approach is more specific, suggesting that the problem is confined to the lesson planning which does not actually involve the students. This paper also concludes that while concept mapping shows the acquisition of a new vocabulary of legal concepts, the method itself is rather less useful for showing whether or not students are developing the skills of making judgement.

Keywords: Concept mapping; Theory-practice gap; Multimodal discourse; Teaching sequence; Conversational theory; Apprenticeship

Biographical notes: Dr. David Hay is a Senior Lecturer in King's Learning Institute, King's College London. He is involved in the academic development of faculty staff and carries out research on the teaching practices of the disciplines. David's work focusses on being able to align teaching in higher education with the practices and cultures of research. His research uses concept maps and often drawing exercises to explore the knowledge-making space which might be shared between students and their teacher-researchers'. David's work in science often focusses on issues of embodiment and the interplay

between modelling and material realization in experimental settings. David serves on the Council for the Society for Research into Higher Education and he is a member of the Society for Social Studies of Science.

Martina Proctor is a doctoral candidate in King's Learning institute and King's College London. She is an experience Law teacher and has particular research interests in legal culture, threshold concepts and links between professional practice and education.

1. Structure

The mainstay of this paper entails a more or less conventional (Novakian) concept map analysis in which we document the quality of learning among first year undergraduates using their before and after teaching maps of "Contract Law". This analysis follows the definition of meaningful learning which is most traditionally associated with the concept mapping method (Novak, 2010), depending on the deliberate integration of new information (i.e. the teaching material) with prior-knowledge (Ausubel, Novak, & Hanesian, 1978; Novak, 1977; Novak, Mintzes & Wandersee, 2000; Hay, 2007). According to this definition the concept mapping data we obtained from students showed that their learning was acquired by rote since we never observed new and old knowledge-structures being brought together in a process of new and reconciliatory knowledge-making.

Our analysis also includes a close reading of map content (see Hay, Wells, & Kinchin, 2008 for methods) and the patterning of meaning (i.e. concept map organisational structure, Kinchin, Hay & Adams, 2000). In this analysis we contrast the linear structure of the lecturer's map of teaching, with the spoke-shaped maps the students drew at the end of the module and the networked structure which the lecturer made to explain her personal understanding of the topic. The basic structural typology which we use to illustrate these differences is shown in Fig. 1. The data and the structural analysis which we employ exemplify the ways in which students learn the teaching-shape (literally, the *order* of the teaching), even while this sequence has little (or no) genuine relation to the complex knowledge-shape of "the legal problem". We term this tendency an "artifice of teaching sequence" and suggest that it is a common concept mapping finding in the higher education setting.

In the latter stages of this paper, we turn towards the more general issue of concept maps being acts of multi-modal discourse (Kress, 2003; Kress & van Lueewen, 2006). We re-examine the concept mapping data in this "linguistic" context exploring the differences between treating concept maps as "*windows into the mind*" (Shavelson, Ruiz-Primo, & Wiley, 2005) *versus* their being acts of conversation (Bakhtin, 1986). Our purpose is to draw attention to some of the questions which unsettle the purely cognitive view: (e.g. "*Is this map the only one a person might have made?*": "*Does one need to practice making concept maps in order to express oneself within that mode?*" and: *"Does a map include 'reply' to someone (or something) 'other' than the author?"*) and we briefly review the possible advantages of the "linguistic turn". This is not a purely theoretical exercise since we exhibit how the shift (from the cognitive to linguistic) highlights issues which are hidden by traditional concept-mapping theory. In particular we show that the "rote learning finding" of this paper and of many likewise cognitively-based concept map analyses of teaching outcomes (Hay, 2007; Hay, Kinchin, & Lygo-Baker, 2008) may be hasty in adopting the rote-learning claim. The linguistic turn is a

much more generous account of the teaching-learning interaction because it acknowledges a variety of conversational learning processes occurring beneath a patina of apparent (surface) reproduction. We do agree, however, that even from the perspective of the "linguistic turn" the problem of the teaching sequence (the "artifice") never vanishes entirely.

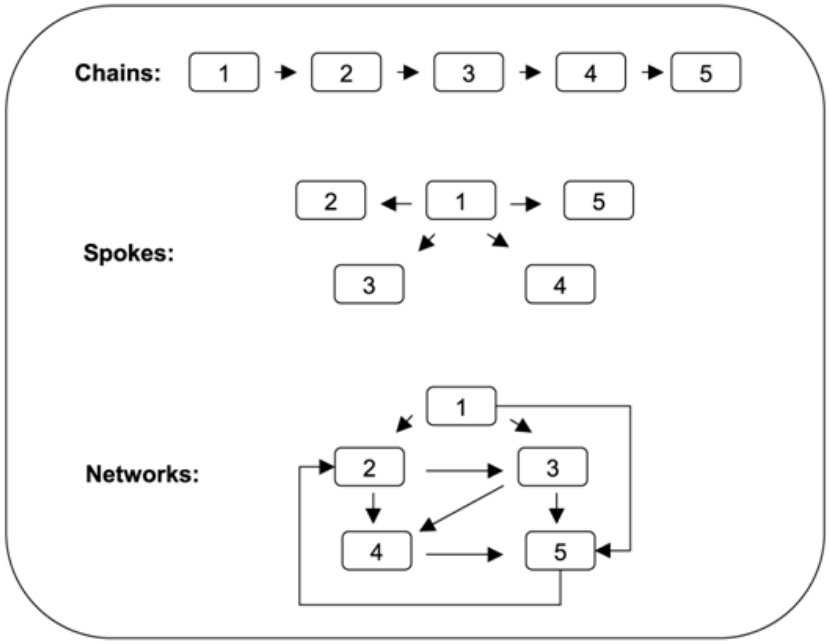

Fig. 1. "Chain"-shape concept maps (top) comprise linear sequences which often recapitulate the temporal sequence of events or instructions. "Spokes" (middle) are radial arrays of labels organised by just one central concept: there is little "pattern" here and usually spoke-type concept maps are superficial statements of unorganised association. "Networks" (bottom) represent more complex knowledge-work, where often a variety of routes are used to reach a simultaneous variety of ends. In concept maps of network-type, single concept-labels can acquire a variety of meanings as a consequence of the different reading paths which are used to reach them. Traditional concept map analysis invokes cognition and tends to insist the concepts have one single (definitive) meaning. The more plural meanings occurring in networked maps might be more readily explained by linguistic (or literary) theory.

2. Mapping knowledge-change

Concept mapping method (Novak, 2010) has an excellent track-record of benefits in higher education (reviews by Hay, Kinchin & Lygo-Baker, 2008; Kinchin, 2014). First, concept maps are teaching tools (Novak & Gowin, 1984) which deliberately encourage students to establish meaningful relations between the new material they are taught and the prior-knowledge that they bring to the learning setting (see, Daley & Torre, 2010 for example) and while using concept maps as tools to facilitate such active learning, the knowledge-change which is visualised in students' successive maps can prompt for further rounds of teacher-student dialogue (Kinchin, 2003), addressing potential misconceptions (Kinchin, 2003) and managing the teaching-course towards new insights (Kinchin & Cabot, 2010). Second, and related to the way that concept maps make

learning process visible (Hay, Kinchin, & Lygo-Baker, 2008), concept mapping methods are research tools allowing teachers to gather qualitative and quantitative data concerning: i) the prior knowledge and experience of students (Hay, Wells, & Kinchin, 2008); ii) the prevalence of student misconceptions in a given field (Kinchin, 2000; 2001); the quality of cognitive change through time (Novak & Mussonda, 1991; Hay, 2007); and iv) the trajectories of student cohorts in relation to the targets of curriculum and/or the teachers' more personal knowledge structures (Kinchin, 2001; Kinchin, deLeij, & Hay, 2005). Concept mapping methods have also been used to: i) compare "expert" and "novice" knowledge structures (Kinchin, Cabot, & Hay, 2008); ii) juxtapose "teacher" *versus* "novice" understandings (Kinchin & Hay, 2007); and iii) organise student study-groups (Kinchin, deLeij, & Hay, 2005; Kinchin & Hay, 2005). All of these benefits accrue from the close intertwining of the concept mapping method and its underling cognitive model. This is explained below as a back-drop to the more "linguistic" turn developed later in this paper.

2.1. Concept mapping theory and its teaching implications

The concept mapping method is intertwined with Ausubel's "*Theory of Meaningful Reception Learning*" (Ausubel, 2000, reprinted (with minor corrections) from an original publication in 1963). Indeed Ausubel (2000) provides the broad psychological framework which was the theoretical antecedent to Novak's method (Novak, 2010) and the basis for being able to measure learning quality with concept maps (Hay, 2007). This is because Ausubel defines learning as reception of new knowledge where rote acquisition is the consequence of simple repetition of information, while meaningful learning involves the active reconciliation of the new material within a pre-existing knowledge-structure (Novak, Mintzes & Wandersee, 2000). In Ausubel's words:

> "*Meaningful reception learning primarily involves the acquisition of new meanings from presented learning material. It requires both a meaningful learning set* [intention and behaviour] *and the presentation of potentially meaningful material to the learner. The latter condition, in turn, presupposes (1) that the learning material itself can be nonarbitrarily (plausible, sensibly, and nonrandomly) and nonverbatimly related to any appropriate and relevant cognitive structure (i.e., possesses "logical" meaning) and (2) that the particular learners' cognitive structure contains relevant* anchoring *ideas to which the new material can be related. The interaction between potentially new meanings and relevant ideas in the learner's cognitive structure gives rise to actual or psychological meanings. Because each learner's cognitive structure is unique, all acquired new meanings are perforce themselves unique.*" (Ausubel, 2000, p. 1).

As Novak (2010) points out, there are three vital teaching implications in this theory. First, "good teaching" necessarily requires *measurement of* students' prior-knowledge, because otherwise it would not be possible to introduce new material in meaningful ways. Second, it requires that teachers document the ways in which the new teaching material is integrated (or not) within learners' knowledge structures. Third, while it makes *teachers* responsible for measuring the outcomes of their students' learning, it also states that it is the *students* who are primarily responsible for their learning outcomes (Novak, 2010; Novak, Mintzes & Wandersee, 2000; Haggis, 2009). Furthermore, as Ausubel (2000) also adds, these three principles also combine uniquely, requiring that all new meanings are ("*perforce*") unique (Ausubel, 2000). Nevertheless

these three (or four) concept mapping virtues are realised somewhat differently depending on the methods used for analysing concept mapping data. This is what we turn to next.

2.2. Assessing concept maps

"*Learning How to Learn*" (Novak & Gowin, 1984) was the first book to make the concept mapping method widely available. Here Joseph Novak and Bob Gowin also explain the rubric of quantitative concept map assessment methods and while these authors are careful to express their reservations about the exclusive use of quantitative concept mapping scores, qualitative scoring has become the method of choice for most of the subsequent literature. These qualitative approaches tend to rely on the numbers of "correct" propositions in a concept map and an aggregate score of map-complexity (i.e. the number of concept labels; the number hierarchies established; and the number of links crossing (or bridging) these hierarchies).

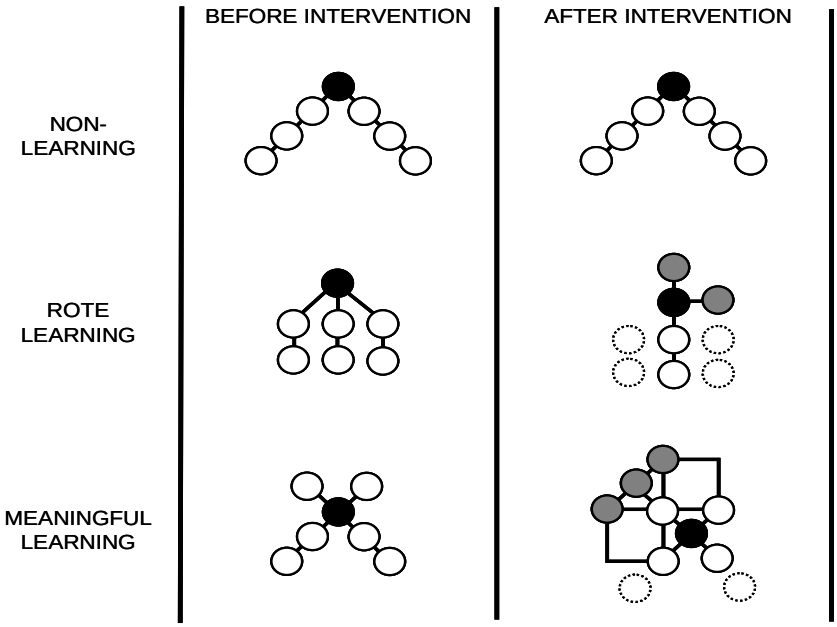

Fig. 2. Concept maps comprise the labels for concepts (ideas) [shown as circles] and the links between them that can be used to make meaning [lines between circles]. In concept maps, each link is labelled to explain the meaning that is made of the two ideas thereby held together. Thus concept maps actually comprise a series of related propositions describing what the author knows about a particular topic and how he understands it. Altogether, the propositions that make up the map comprise an explicit cognitive structure. If maps of the same topic are compared BEFORE and AFTER a teaching INTERVENTION, the degree of integration among **new ideas** [grey circles] and extant parts of the prior-knowledge structure (white circles) can be assessed. The absence of change is indicative of non-learning [top], while rote learning is visualised as the simple addition of new ideas without integration [middle]. Where new meanings emerge because of the integration of new and old cognitive material then meaningful learning is deemed to occur [bottom].

Kinchin, Hay, and Adams (2000) are particularly critical of "correct" and "aggregate" scoring methods, however, drawing on the work of Jonassen, Reeves, Hong, Harvey, and Peters (1997), Lui and Hinchey (1996) and Ruiz-Primo and Shavelson (1996), to state that: "*the usual emphasis on valid links seems to contradict the*

constructivist philosophy underlying the use of concept maps" (p. 46); while also: "*the aggregation of scoring elements creates a blurring of what the overall score actually means*." (p. 46). Thus some of the more recent literature of concept map analysis emphasises qualitative description and focuses on either the *qualities* of change from one map to another (see the writing-content analysis of Hay, Wells and Kinchin, 2008, for example) or the ways in which map structure might visualise individuals' particular propensity for learning (Kinchin, Hay, & Adams, 2000; Hay & Kinchin, 2006). Both of these strands (analysis of changing *content* and of changing *structure*) are brought together in the work of Hay (2007) which is summarised in Fig. 2. This work also links the literature of concept mapping research to the vocabulary more commonly adopted in higher education - moving between the discourse of rote and meaningful learning (Novak, 2010) and the concepts of deep and surface learning (Marton & Säljö, 1976), and/or personal learning (Jarvis, 2006), for example. This quantitative framework forms the basis of analysis in the following case studies which are situated in first year undergraduate teaching for "Law of Contract".

3. "Law of Contract"

The teaching of first year Law of Contract was chosen as the setting of this study. Like many other higher education disciplines, "Law" is one of those fields where first year undergraduate modules tend to cover "basic theory" relying on lectures and tutorial or seminar-type discussion as a possible preparation for the actual experiences of practice (apprenticeship) later. In such situations there is general accord that while it might not be "the practice" which is taught, at least the introductory teaching ought to achieve the knowledge-structures (Kinchin & Cabot, 2010) and the academic literacy (Lea & Street, 1998) which correspond to practice later (Mertz, 2007). In this regard, Law is a particularly useful arena for research since we have good accounts of the practice ideal. Mertz (2007), for example, documents the languages of the law-school classroom in relation to the ways that lawyers think and speak while engaged in legal practice. Within the larger field of Law, however, choosing "Law of Contract" was a matter of happenstance, depending on the interest, experience and teaching commitments of one teacher in a University Law School.

3.1. Setting

In this Law School Setting, first year law undergraduates study "*Law of Contract"* as one of the four modules that lead to their Intermediate Examinations in the third semester of the first academic year. Teaching takes place during the autumn and spring semesters. In every week of the twenty-four week module, all the students receive two 1-hour lectures which are given for the students all together while also each student has a 1-hour weekly tutorial session in the days following the lectures. At the time this study was carried out, tutorial groups comprised 12 to 14 students. The tutorial programme follows the lecture topics, so that students should come to each tutorial session prepared to discuss the particular legal scenario which has already been introduced in the lecture and about which they have been set appropriate material to read before the tutorial. The students who took part in this study (47 in all) belonged to four tutorial groups managed by one particular teacher. Most of the students had come straight from school and most had progressed through the English school system although a substantial minority had been educated elsewhere in the UK or overseas.

3.2. Student "learning" data

The students made concept maps of *Contract Law*, before and after the taught programme. The first maps were made at the first tutorial meeting (after a 20 minute lesson on the concept mapping method). The second map was made at a revision tutorial, three weeks prior to the module exam and when all the teaching in lectures had been finished. On both occasions the students were told that their concept mapping task comprised efforts to make explicit their *personal* understanding of Law of Contract. This was described as a formative (rather than summative) assessment exercise and on both occasions, the students were given 40 minutes for the making of each map. In actual fact, some students finished their map making in as little as 25 minutes, while others used the total of the time allowed. All of the maps were hand-drawn/written on A3 paper and often (but not always) using small-sized Post-It Notes™ as a vehicle for concept-labels while linking statements (and their corresponding) arrows were scribed directly on the page. Copies of both the first and second maps were returned to the students, but only after the second mapping exercise had been completed. Since the purpose of the student-study was to explore their knowledge-making in relation to the teaching, neither of the concept maps which were made by the lecturer were provided to the students until all the research data had been collected. We presumed that having access to the lecturer's map of the teaching or to their map of personal understanding might have exerted a considerable effect on the students own map-making.

The analysis of student data was done on a case-study basis and includes a detailed commentary on the maps made by just six students. These six cases were selected after the end-of-module examination and were chosen by random sampling from the top (2 students) and bottom (2 students) interquartile groups; and from within two standard deviations of the mean (2 students). To fit within the word-count of this paper, however, only three of these six cases are described in detail.

3.3. Analysis of module teaching-structure

The lecturer for the module made a concept map to describe the teaching programme. This was completed in the first two weeks of teaching and is shown in Fig. 3. The map comprised 74 different concept labels arranged under two super-ordinate concepts which distinguish between the ***theory****-based components of the module* and the modules' account of related legal ***processes***. The map also comprised links to other relevant parts of the undergraduate curriculum.

In her map, the lecturer used general (or lay) explanations of the topic rather than specific legal terminology to introduce the different themes. Technical concepts like *breach*, *frustration* or *undue influence*, for example, were always subordinate to common-place descriptions of *apparent contracts* and *what might go wrong* within them. Thus, terms like *rescission* and *restitution* always came after their more general descriptions and were preceded by explanations, e.g. *statements of fact leading to the making of a contract but not being part of it*. The structure was highly compartmentalised with very few links between one "zone" and another (Fig. 3).

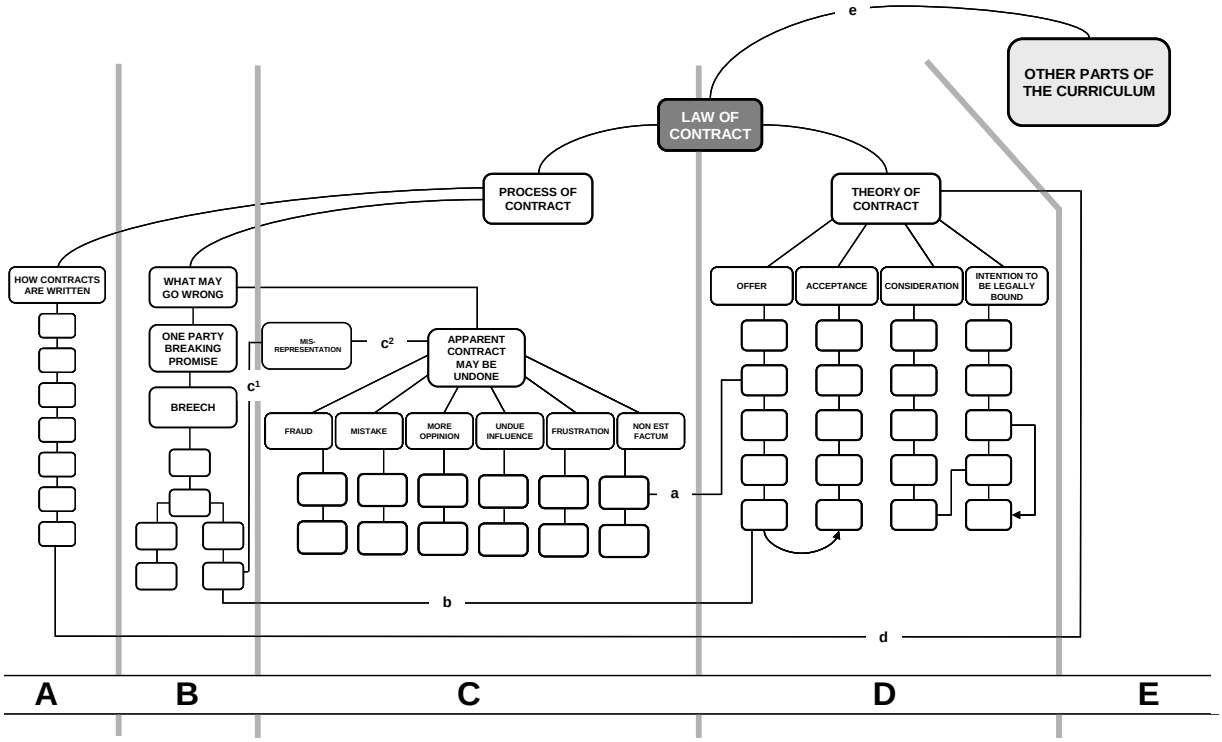

Fig. 3. The lecturer's map of the module comprised the targets of the curriculum arranged into discrete zones for the delivery of teaching. To enable a view of the overall morphology of the map, most of the concept labels and links have been omitted in this re-drawing but the **concept labels** were as follows: **Zone A** (8 concepts) under the heading, HOW CONTRACTS ARE FORMED: PARTY (PARTIES), LEGALLY BINDING, PROMISE, FORMAL (FORMALLY), INFORMAL, SEALED DEED, CUMULATIVE CRITERIA. **Zone B** (9 concepts) under the heading, WHAT MAY GO WRONG ONE PARTY BREAKING (THE) PROMISE, BREACH, CLAIM(S), AMOUNTS, TYPE (OF BREACH), EXCLUSION CLAUSES, UNFAIR CONTRACT TERMS ACT (UCTA)1977, UNFAIR TERMS IN CONSUMER CONTRACT (UTCC) 1999. **Zone C** (19 concepts) under the heading APPARENT CONTRACT MAY BE UNDONE: FRAUD, MISTAKE, MERE OPINION, UNDUE INFLUENCE, FRUSTRATION, NON-EST-FACTUM, MISREPRESENTATION, VOID (VOIDABLE), DISTRIBUTION OF CASES, RIGHTS, FRUSTRATED CONTRACT ACT, "*THAT IS NOT MY DEED*", MISTAKE IN AGREEMENT OR MISTAKE OF POSSIBILITY, ESTOPPEL, INNOCENT PARTIES, RESCISSION, NEGLIGENT MISREPRESENTATION, MISREPRESENTATION ACT 1967 S 2 (1). **Zone D** (25 concepts) under the heading THEORY OF CONTRACT: OFFER, ACCEPTANCE, CONSIDERATION, INTENTION TO BE LEGALLY BOUND, INVITATION TO TREAT, MERE "PUFF", MATCH (OF THE TERMS OF THE OFFER), REQUEST FOR INFORMATION, GIVEN IN RETURN FOR A PROMISE, SOCIAL SITUATIONS, NECESSARY (BUT NEED TO BE SUFFICIENT), CONTRACT COMES TO AN END, SERIOUSNESS, IMPACTS, EXPECTATION LOSSES, LOSS OF OPPORTUNITY, RELIANCE, CONDITIONS, WARRANTEES, INNOMINATE, DAMAGES, TYPES (OF TERMS), TECHNICAL EXPRESSIONS. **Zone E** (9 concept labels) under the heading OTHER PARTS OF THE CURRICULUM (not listed).

Each zone was **linked** to at least one other, but usually these linkages were in terminal positions. Thus link **a** read as follows: *MERE "PUFF"* (Zone D) *is another term for MERE OPINION* (Zone C): **b** read: *CLAIM(S)* (Zone B) *for DAMAGES* Zone D); **c**^{1} *The APPARENT CONTRACT MAY BE UNDONE* (Zone C) *because of MISREPRESENTATION* **c**^{2} *possibly leading to CLAIM(S)* (Zone B); **d** *CUMULATIVE CRITERIA* (Zone A) *must be considered carefully in the THEORY OF CONTRACT* (Zone D), and **e** *LAW OF CONTRACT* (top level concept) *encompasses other issues (like LAW OF TORT) that are dealt with in OTHER PARTS OF THE CURRICULUM* (Zone E). These few linking statements were the only bridges form one ZONE to another.

In brief summary: 1) there was a superordinate divide between "**theory**" and the [practical] "**process**" of making "Legal Contracts"; 2) the map was highly compartmentalised (divided into zones); and 3) there was minimal linkage between one zone and another, while the links that did bridge zones always came at the end of the reading sequences (as *if* to state: *"now that topic is completely finished we can pass on to the next set of issues*"). Overall, the organisation of the map was essentially identical to the temporal sequence of the teaching: Weeks 1 to 5: Formation of contact; Weeks 6 – 12: Vitiating factors (misrepresentation, mistake etc.); weeks 13-18: Terms, exclusions, clauses etc.; and weeks 19-24: Remedies for breach of contract".

Two other detailed features of the lecturer's map were conspicuous. First, cases and statutes were rarely identified explicitly. Second, the map located the concept of a "*Law of Contract"* in the wider scene of the undergraduate curriculum even while explicitly stating that these bridging concepts (linking "Law of Contract" to other modules) were not covered in the module.

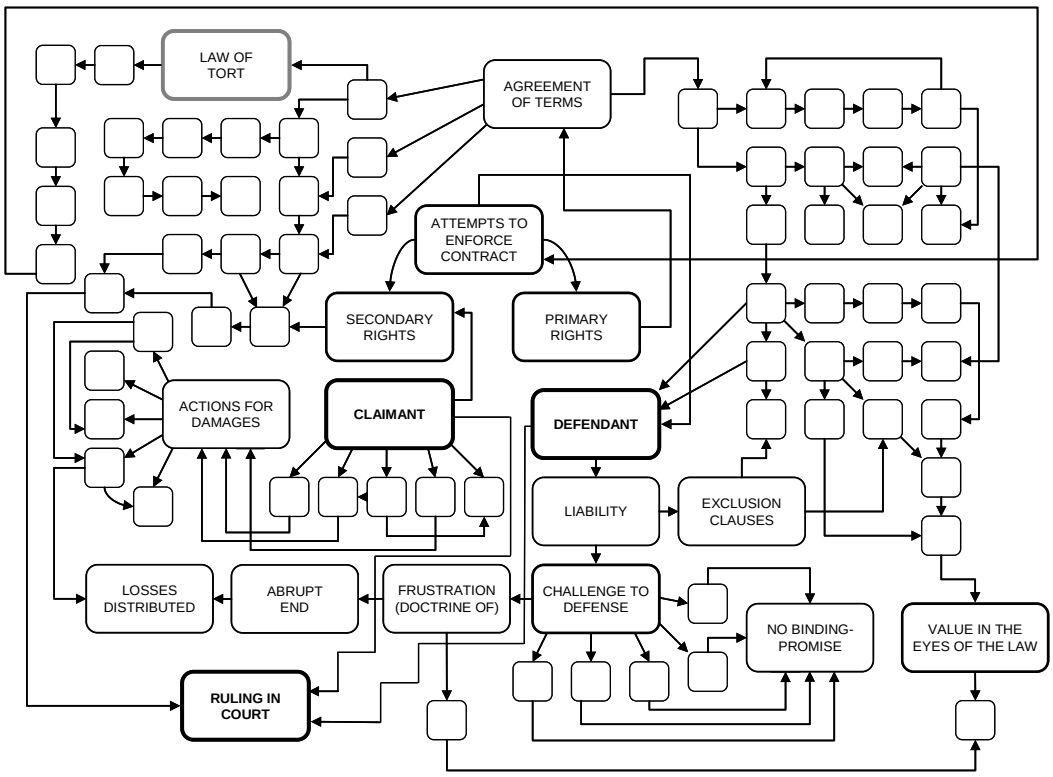

Fig. 4. The lecturer's map of *"Contract Law"* used 84 concept labels. As in Fig. 3 the detailed content of the map is omitted in this re-drawing allowing a better visualisation of the morphological structure of the whole. All of the labels used in Fig. 3 occurred in this map as well, but there were 17 unique concepts (shown). Among the new ideas, three concepts (of the DEFENDANT, CLAIMANT and the RULING IN COURT), were used to describe a new perspective of the topic (highlighted in bold): one that emphasised the practical applications of legal concepts. This sense of meaning was never explicit in the map of teaching (Fig. 3) but here it was used to enable complex integration of many different ideas belonging to the practices of contract law. Several concepts in the map of teaching also emerged with a new-found organisational role. One of these (LAW OF TORT) had been confined to the list of issues *'not taught on the module'* in the teaching map but was an organising concept here.

3.4. The teacher's "personal" understanding

At the end of the module, the teacher provided another map of the topic. This map was made to describe their personal understanding of the concept of *Law of Contract*. It is shown in Fig. 4.

This map used all of the concept labels that had previously appeared in the map of the module (Fig. 3), but it used an entirely different *structure* to show how the topic was understood. Where the map of teaching was organised in discrete and isolated topic areas (zones), the map of personal understanding was a complex integrated network which often conflated the "theory" and "process" topics which had been previously held apart. Moreover, several new concepts were introduced here. The ideas of the *claimant*, *defendant* and the *ruling in court*, in particular were used to show how the application of legal concepts in practice was best envisaged as if: "*taking sides from either pole in a legal contest*"[1].

The concept of *law of tort*[2] was also prominent in the lecturer's personal understanding of the topic (Fig. 4), while previously (i.e. in Fig. 3) it was confined to the group of ideas *'not taught on the module'*.

Table 1
The frequency of lecturer's concept labels occurring in the students' maps

Concept label (zone)	Frequency of use by students		Change
	Prior knowledge	Post-learning	
Acceptance (D)	4	5	+1
Breach (B)	1	1	-
Conditions (D)	-	2	+2
Consideration (D)	2	5	+3
Damages (D)	-	3	+3
Estoppel (C)	2	2	-
Exclusion clauses * (C)	2	3	+1
Invitation to treat (D)	4	1	-3
Intention to be legally bound (D)	1	4	+3
Legally binding promises (A)	2	2	-
Loss of opportunity (D)	-	1	+1
Misrepresentation (C)	-	4	+4
Offer (D)	3	4	+1
Recession (C)	-	2	+2
Terms (D)	2	2	-
Rights (C)	-	1	+1
Void (C)	2	2	-

* The concept of EXCLUSION CLAUSES (in the lecturer's map) was represented in the maps made by students by citing the UNFAIR CONTRACT TERMS ACT (UCTA), the UNFAIR TERMS IN CONSUMER CONTRACT REGULATIONS (UTCCR) and the 'reasonableness test' that is part of UCTA.

[1] This quote corresponds to one of the linking statements in the lecturer's second map.

[2] Some institutions tend to teach "contract" and "tort" together as part of "Law of Obligations". Tort law concerns civil wrongs (distinct from crimes).

3.5. Students' knowledge-structures before and after the module

Table 1 is a summary of the concept labels that were used in the lecturer's map of teaching (Fig. 3), but also occurred in the students' maps before or after learning. Only 17 of the 74 the lecturer's labels were used by any of the six students and no one idea was used by all six students. The concepts of *acceptance* and *consideration* were the most common at the end of the module (used by 5/6 students). An *intention to become legally* bound, *misrepresentation* and *offer*, were each used by 4/6 students after learning and the concept of *damages* (3/6 students) was the next most frequent concept label. None of the 17 ideas unique to the lecturer's personal knowledge structure were ever used in any of the student's maps.

Among the 17 concepts common to both the teacher and the student group, 11 were known to the students before-hand and 6 were newly "discovered" after the teaching. These newly added concepts were *conditions*, *estoppels*, *loss of opportunity*, *misrepresentation*, *rescission*, and *rights*. In the particular instances in which technical legal concepts such as "consideration" and "estoppel" were evident in the student's prior-knowledge it is highly likely that these individuals took A level Law where Law of Contract is often a feature. Our research did not verify this contention, but these are specialist terms and unlikely to be encountered outside of teaching, learning or apprenticeship-type experience.

The lecturer's teaching map was divided into 5 discrete zones (Fig. 3). Only one idea from zone A (headed by the title, *how contracts are written*) was represented in any of those made by the students; this was the idea of *legally binding promises* (2 students before and after learning). Just one student used one idea (*breach* of contract) from zone B (i.e. *what may go wrong* in contracts apparently agreed). Five concepts in zone C (how the *apparent contract may be undone*) and 10 in D (the *theory of contract* law) were more common[3].

All of the students' maps were highly compartmentalised, but the division of knowledge into discrete and separate structures was much more pronounced in the maps made *after* teaching than it was in their prior-knowledge. Prior-knowledge maps were also more explanatory of over-arching principles (and lay descriptions of the topic) while the maps made after teaching also tended to include more specific examples and terminology. In this aspect, they repeated the content-form of the lecturer's teaching map (Fig. 3) as well as reproducing its highly compartmentalised (temporised) sequence. These issues are exemplified in the three case studies below.

4. Detailed "learning" case analysis

In order to explore the visible events of learning, three of the six case-studies are described in detail. The identities of the students in question are protected by pseudonyms and to help visualise the structure of the students' maps, these have been re-drawn from the originals.

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[3] It is interesting to note that in this regard the students gave considerable privilege to concept labels belonging to the **theory** zone of the teaching map rather than the **process** (i.e. 10 of 25 [40%] theory labels were used by the students *versus* only 7/39 [18%] of labels occurring in the process zones).

Case one: Mike

Mike was one of the students selected from the upper interquartile of module exam scores. His prior-knowledge structure (Fig. 5) showed that he had a sound grasp of the topic to begin with. At the outset he was already using terms like *offer, acceptance* and *invitation to treat* and he was even citing specific cases (e.g. *Fisher and Bell*[4]), all-be-it using "incorrect" conventions (see later).

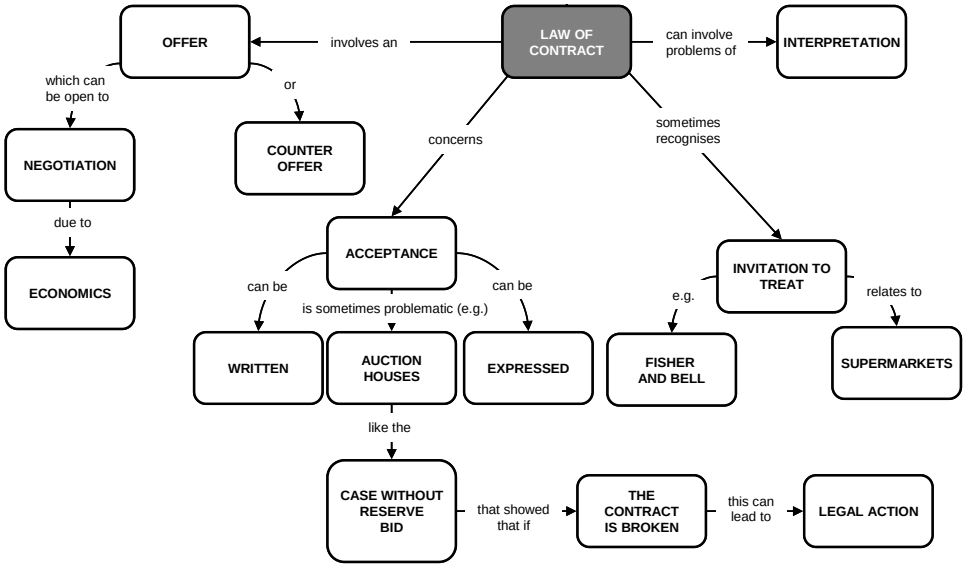

Fig. 5. Mike's map before the module

After the module, Mike's description of the subject (Fig. 6) was more sophisticated and he was able to illustrate his knowledge using many new examples of legislation and specific legal cases.

Mike's map before learning (Fig. 5) was a spoke-structure *(*Kinchin, Hay, & Adams, 2000): it was divided into four discrete subject areas, each of which was arrayed about the top concept of *law of contract*. The four areas were identified by the organising concepts of *offer*, *acceptance*, *invitation to treat* and *interpretation* and with one exception (*interpretation*), each of these were then explained in a subordinate chain of association. To exemplify: The longest [6 stage] linear reading path was as follows (beginning [1] "*law of contract*" concerns "*acceptance*): [2] *acceptance* (super-ordinate) is sometimes problematic, [as exemplified (e.g.)] [where] [3] *auction house* cases like [4] the *case without reserve bid* showed [5] that if the *contract is broken* [6] this can lead to *legal action.*

Mike's second map (Fig. 6) comprised four distinct areas (zones) of knowledge. These zones were rarely linked to one another. The two larger zones (about "*contract formation*" and "*a theory of contract*") were related by just one link and the two others (both about "*what can go wrong in contracts*") were completely isolated. These patterns

[4] In Mike's first map (prior-knowledge) he wrote *Fisher and Bell* and in his map after learning he cited *Fisher v Bell, Farley v Skinner, Williams v Roffey* and *Jackson v Horizon Holidays*. He had learnt to cite more cases, but he had also learnt to reference them correctly: English legal tradition puts v, short for the Latin *versus*, but when said out loud, substitutes 'and' instead.

of compartmentalised knowledge corresponded almost exactly with discrete topics of the teaching programme that were shown in the teacher's map of module (Fig. 3). Comparing Mike's first (Fig. 5) and second (Fig. 6) maps shows that two new areas of knowledge were introduced in the course of teaching: one headed by the concept of *promissory estoppel*; and one by *withdrawal from contract*. These were not related to any other parts of the knowledge-structure however and, while Mike was able to define these new ideas, his learning-work fails to satisfy the criteria of meaningful learning because there is no active reconciliation of the new and old material. Even while Mike obtained the highest examination marks in the sample, we must conclude that Mike's learning has been achieved by rote.[5]

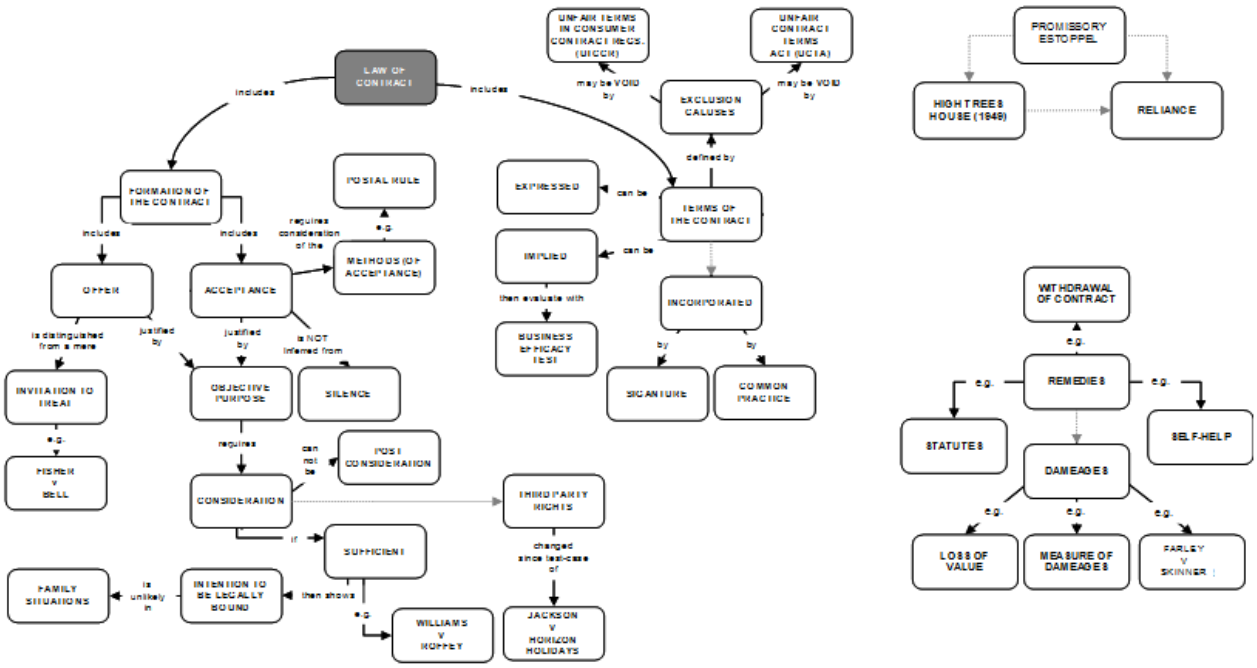

Fig. 6. Mike's second map

[5] We note that in relation to exams based achievement the rote learning claim is somewhat equivocal. On one hand it suggests that in this instance, concept mapping might not be a legitimate measure of student learning, on the other hand, it is also plausible that the examination also rewards learning by rote. The first of these views (the view that concept maps perhaps are unreliable as student-learning measures) runs counter the majority of concept mapping literature and yet we might suggest that this student (Mike) has failed to articulate his deeper understandings as a consequence of having to use the concept mapping mode. For instance, in his second map, an "expert reader" will spot that "*Promissory Estoppel*" "*ought*" to be related to "*Consideration*" (since where there is variation in a contract which is unsupported by real consideration then the defendants may be able to rely on promissory estoppel). If this is so, then that "expert reader" is also likely to spot the inference that the student may indeed know this link, even while they fail to draw it in their map. This is because they do in fact cite the case of *High Trees House* (1949) which is its corresponding precedent. This is one of many possible inferences however and it is to read a lot into the students' map which is not actually explicit there. It is simpler to conclude that the concept mapping and examination mark *both* converge towards rote-learning, but this too is a very problematic assumption.

Case two: Jenny

Jenny's end of module-mark was in the middle of the overall distribution of student grades. Her maps before and after learning are shown in Fig. 7. Jenny's first map was a chain (Kinchin, Hay, & Adams, 2000) and it described the procedures of contract formation. Her second was a spoke-structure and was a list of topics important in contract law.

Jenny's second map contained many new ideas and these comprised concept-labels from zones B, C and D of the lecturer's map. Knowledge from parts A and E of the lecturer's map was lacking and most of the new ideas were related to just the top concept of *contract law* rather than to one another. Jenny had acquired lots of new information by the end of the module, but she had not been able to use it to make new meanings. Her learning was superficial (i.e. learning by rote) because she was unable to integrate prior-knowledge and new material.

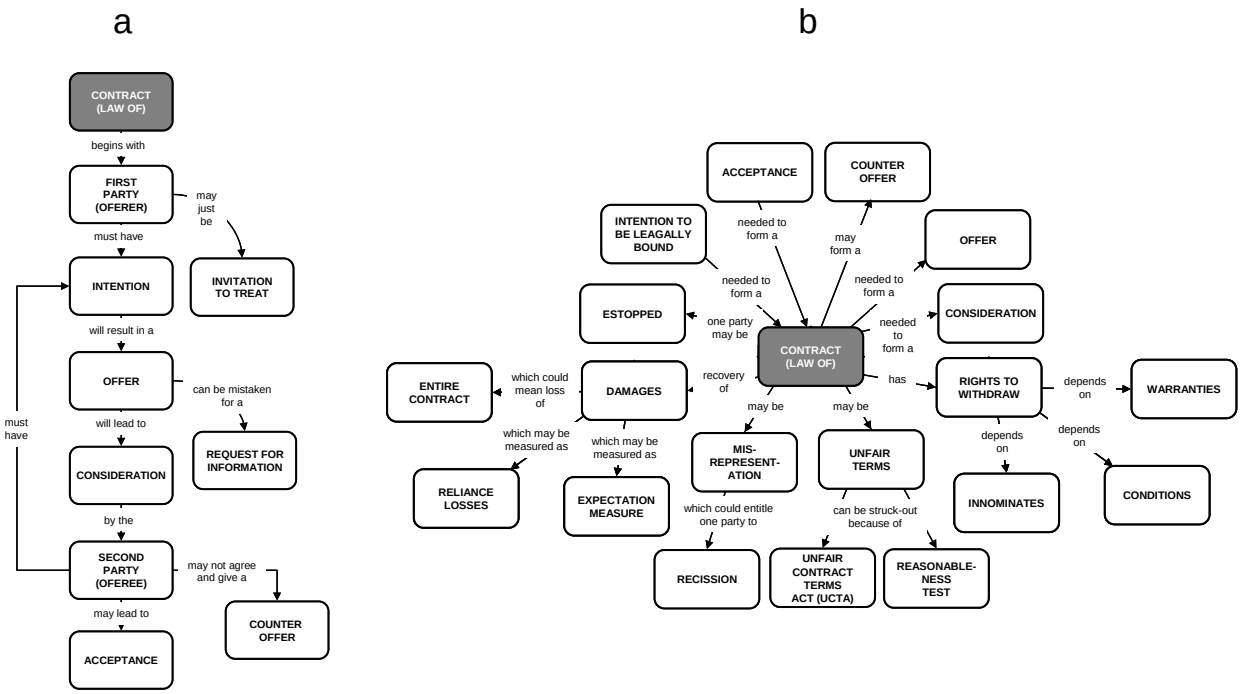

Fig. 7. Jenny's maps before (a) and after (b) the module

Case three: Emma

Emma was in the lowest grade band. Her maps (before and after learning) are shown in Fig. 8). Her first map was essentially a simple network while her second map comprised two structures: a single procedural chain and a spoke of theory. These had been derived from zones B (process) and D (theory) in the lecturer's map and there was only one link between these independent knowledge structures. There was very little evidence that Emma had tried to combine new and prior-knowledge. Instead she had replaced prior-knowledge with a few of the targets of teaching and these were acquired by rote.

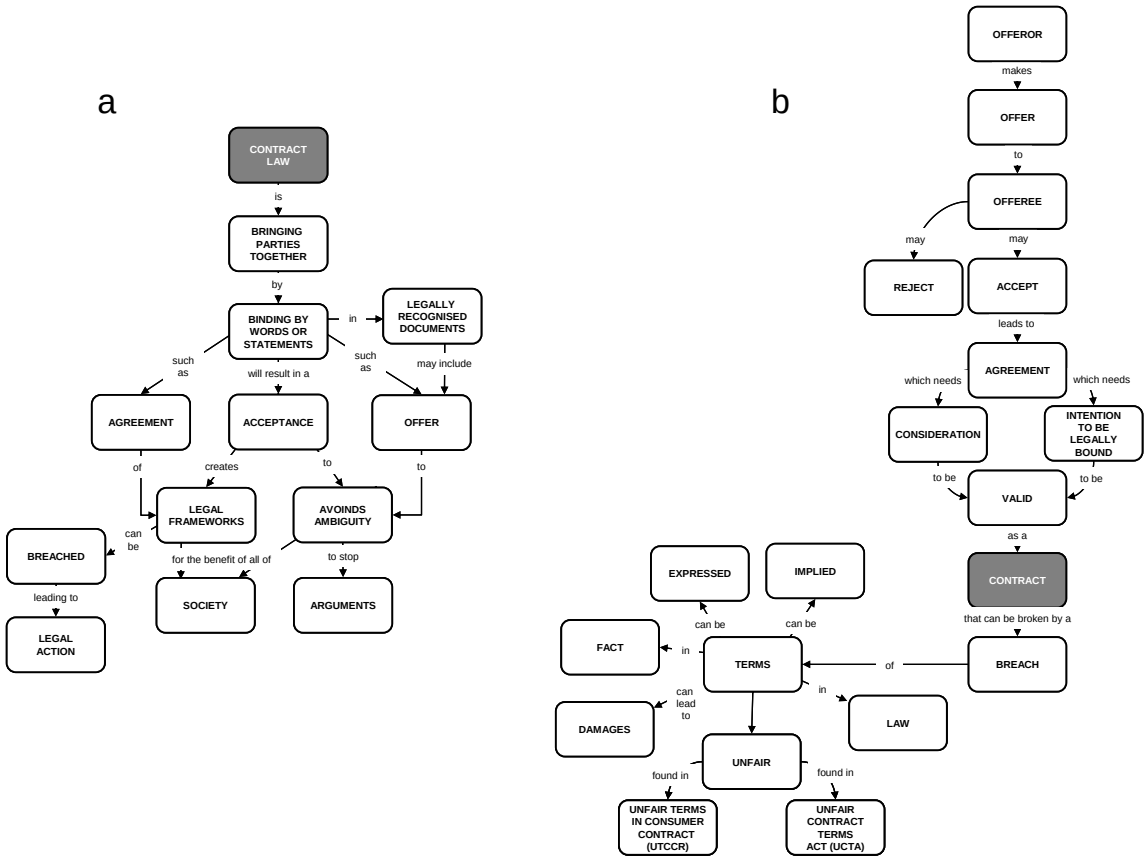

Fig. 8. Emma's maps before (a) and after (b) the module

5. Cognitive inference

These data provide visual summaries of student knowledge-change in the course of learning *Law of Contract*. In all six of the case-studies (and in the three exhibited), the students knew more about the topic by the end of the module. Moreover the richer their prior-knowledge and more complex the organisation of their prior-knowledge structures, the more new information they were able to acquire. As Ausubel predicts prior-knowledge is a key determinant of the ability to assimilate new knowledge-content (Ausubel, 2000). However, in all of these case studies we explored, the documented concept mapping trajectory fails to satisfy the criteria of meaningful learning (Novak, 2010). New material was replaced or was simply bolted onto extant parts of the previous prior-knowledge structure. Only one of the three detailed case-studies (Mike) showed any evidence of the making of new links and this was achieved by the development of new personal meanings *within* pre-existing structures, rather than through the integration and reconciliation of any new knowledge. This change is therefore as readily attributed to a second practice with concept mapping method (as a writing mode) as it might also be

indicative of learning. Furthermore in every instance that these students acquired new concepts, their rote learning replicated the structure of the teaching. Even in Mike's after teaching map the new organisation was achieved by the same sets of labels which divided the teacher's map of *teaching sequence* (Fig. 3) into its (temporal) zones. This tendency was even more pronounced in the other cases (Jenny and Emma). These zones are not patterned by the hierarchies of concepts which organise the teacher's depiction of the *practices* of "Law of Contract" (i.e. the "personal" knowledge-structure shown in Fig. 4) rather they reflect the simple order of the teaching schedule (Fig. 3).

The lecturer's map of personal understanding achieves a different knowledge-shape to the teaching because it is organised by threshold concepts (Meyer & Land, 2003) such as the concept of "*legal contest*" ["*claimants*", "*defendants*", "*rulings in court*"]. These concepts do not figure in the teaching sequence and perhaps unsurprisingly, they do not enter into any of the students' maps. In the absence of experiential legal knowledge, the students have resorted to learning the new concepts in the simple order these were taught. Perhaps the inscription of the teaching sequence is inevitable since the sequential pattern is the only organising structure supplied and only the temporal order can become the primary facilitator of recall (Corkill, 1992). We might call this problem "artifice of teaching sequence" and it is likely to occur whenever students lack experience and the teaching fails to model a genuine "practice-shape". The phenomenon has precedent in the work of Kinchin, Chadha, and Kokotailo (2008). These authors write:

> *"As university lecturers select and sequence materials for their teaching, a linear structure emerges by default. Such a structure is made explicit within PowerPoint presentations and may even be amplified as PowerPoint invites the lecturer to reduce content to a bulleted format. Such linear sequences have been related to passive, surface approaches to learning."* (Kinchin, Chadha, & Kokotailo, 2008, p. 333).

The linguistic-turn

Thus far the concept mapping data have been treated as evidence of knowledge-structures (as knowledge-shapes in the mind). From this perspective we might be intensely worried if it is true that all that has happened in the course of teaching is that the teaching-sequence has inscribed itself in the students' minds. If these maps are taken as being model *conversations*, however, our concerns might be somewhat moderated. After all, talk (of any kind) is always dynamic, flexible, and amenable to change, even if it is just by virtue of the fact that conversation already includes the intermingled voices of more than one protagonist (Bakhtin, 1986). Such a mingling of voices makes the notion of "reply" a crucial turning-point: if student concept maps are "replies" to "teaching" then we ought not to be so surprised if their sequence recapitulates the order of the teachers' exposition. After all, this is the most common way in which we respond to others in every day speech (by recapitulating) and it is a form that we use even when we are seeking to contradict (as well as to develop/extend) the other speaker (Bakhtin, 1986). From this perspective, the repeat of sequence need not be an inference of just "rote" learning (Hay, 2010). Acknowledging this issue we must also reckon that students' actual knowledge structures (i.e. their personal "knowledges") might differ from their offered (reproductive) concept maps just as much as their lecturer's "personal" understanding (Fig. 4) is already accepted as being very different to their map of teaching-sequence (Fig. 3). In this light

the students' concept mapping data corroborates the view of a problematic difference between the "teaching sequence" shape and that of "personal" (or problem-based) maps of Law, but the claim that the students' learning is by rote is very much weakened[6].

In this linguistic view the problem of the artifice of teaching structure does not vanish; rather it is emphasised because we are in fact more certain that the teaching/learning "conversation" is being governed by something (specifically the teaching sequence) with is extraneous to the practices of Law. Rather than locating the problem in the unlikely meeting between minds (i.e. the cognition of the students and their teacher), however, we now might see the problem elsewhere: located in the phase of teaching which does not involve the students at all, but happens during teaching preparation.

6. Concluding discussion

A considerable amount of Ian Kinchin's work exhibits the important role of concept maps as practice heuristic structures (see Kinchin & Cabot, 2010 in particular). To conclude this paper we extend this view of the virtues of the concept mapping method by suggesting that it becomes a means of producing the practice-teaching template (Kinchin & Alias, 2005). Here the purpose must be to interrupt the problematic (linear) "teaching" sequence, offering instead more complex architectures (networks) which enable a variety of navigation routes through material (Kinchin, Chadha, & Kokotailo, 2008; Kinchin & Alias, 2005). This implies a change of teaching method (a shift from delivery mode towards student-led inquiry). This is not unprecedented; in fact it is in accord with the contemporary mood of teaching quality enhancement (Biggs, 2003) where the emphasis is on engaging students as partners in learning and teaching (Cook-Sather, Bovill, & Felten, 2014) and student-centeredness is seen as being key to educational transformation (Blackie, Case, & Jawitz, 2010).

More specifically, however, we also suggest that the structure of such an organising template need not be assembled only out of abstract knowledge; better we base these structures on their respective matters of concern (i.e. legal problems): After all it is such "problems" which organise our lecturer's map of practice, using concepts such as the "defendant" the "claimant" and the "ruling in court" to do so. Even where it is necessary that apprentice-style education should come after a more abstract introduction (the "basics") that introduction will be all the more useful later if it is sufficiently anchored in "the real thing" (Latour, 1987). At the very least, the introductory teaching should provide a "place-holder" for the *practices* of Law and it is very unlikely that teaching can achieve this "holding" function unless it is already modelled on a genuine practice-shape (Hay, Williams, Stahl, & Wingate, 2013).

This paper has used concept mapping to document student's changing understanding in Law of Contract. Two different approaches to concept map analysis have been described: 1) a conventional (cognitive) approach based on measures of change in knowledge-structure; *versus*: 2) close reading of content where each map is taken as an act of multimodal discourse. This shift towards language has comprised two moves: a) It implies that students' concept maps ought to be taken as measures of the

[6] Here it is important to underline the switch of emphasis which has occurred. From the cognitive perspective the students' maps comprise the measure of their learning quality. Form the conversational perspective the students' concept mapping data is another picture of the teaching process and NOT the learning which is a consequence of the teaching.

quality of the *teaching* conversation (rather than being measures of the students' learning outcomes); b) It locates the teaching "problem" in the lecturer's willingness/ability to ground teaching-structure in relationship towards the context of "a legal problem" (rather than just teaching and testing the vocabulary of "basic" concepts). In this regard our paper points at the importance of the teacher who is able to help students acquire a position which approximates to "Counsel's Opinion". With such a view in mind perhaps it matters less whether or not a student becomes specialist in any particular branch of Law, and what matters more is that they are able to assess claims and counter-claims in carefully articulated ways. This view is to bridge the curriculum of the University Law School to the development of judgement (Abercrombie, 1989).

While the different approaches to concept maps analyses we have used both combine in focussing attention on the problem of a teaching interaction which is conventionally organised by the linear sequences of slides, lectures and teaching-weeks, nevertheless, our analysis also raises concerns about the use of concept mapping in the higher education setting particularly if students' concept maps are taken apart from the conversational setting of the dialogic classroom and used to make inferences about what individual students know (or don't know). We therefore urge caution in the use of concept map analysis for the purposes of teaching quality enhancement even while we reach conclusions which are in accord with several previous concept mapping based analyses (Hay, Kinchin, & Lygo-Baker, 2008; Kinchin, Chadha, & Kokotailo, 2008; Kinchin & Cabot, 2010). We have suggested that "basic" higher education might legitimately exist as a place-holder for "a real experience" later but we also suggest that problem solving ought to hold the ground to start with rather than being postponed until after the "basics" of disciplinary vocabulary have been acquired. Indeed this view of a vocabulary of concepts which are learned *in the process of application* towards legal problems is perhaps an organising principle for the curriculum of the University Law School. In order to be better able to use concept mapping to assess the success (or otherwise) of such a problem-based curriculum it is essential that further research should establish the extent to which concept maps can be made to measure acts of making judgment. Despite the virtues of the concept mapping method it is possible that sometimes, and in some particular situations, it too may contribute towards facsimile production.

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References

Abercrombie, M. L. J. (1989). *The anatomy of judgement: An investigation into the processes of perception and reasoning*. London: Free Association Books.

Ausubel, D. P. (2000). *The acquisition and retention of knowledge: A cognitive view*. Dordrecht, The Netherlands: Kluwer (originally published as: Ausubel, D. P. (1963). *The psychology of meaningful verbal learning*. New York: Grune and Stratton).

Ausubel, D. P., Novak, J. D., & Hanesian, H. (1978). *Educational psychology: A cognitive view*. New York: Holt, Reinhart & Winston.

Bakhtin, M. M. (1986). *Speech genres and other late essays*. Austin, Texas: University of Texas Press.

Biggs, J. (2003). *Teaching for quality learning at university: What the student does* (2nd ed.). Buckingham, UK, Open University Press.

Blackie, M. A. L., Case, J., & Jawitz, J. (2010). Student-centredness: The link between transforming students and transforming ourselves. *Teaching in Higher Education, 15* (6), 637–646.

Cook-Sather, A., Bovill, C., & Felten, P. (2014). *Engaging students as partners in learning and teaching: A guide for faculty*. New York: Jossey-Bass

Corkill, A. J. (1992). Advance organizers: Facilitators of recall. *Educational Psychology Review, 4*(1), 33– 67.

Daley, B. J., & Torre, D. M. (2010). Concept maps in medical education: An analytical literature review. *Medical Education, 44*, 440–448.

Haggis, T. (2009). What have we been thinking of? A critical overview of 40 years of student learning research in higher education. *Studies in Higher Education, 34*(4), 377–390.

Hay, D. B. (2007). Using concept mapping to measure deep, surface and non-learning outcomes. *Studies in Higher Education, 32*(1), 39–57.

Hay, D. B. (2010). The imaginative function in student learning: Theory and case study data from third year neuroscience. *The Journal of the Hellenic Psychological Society, 17*(3), 259–288.

Hay, D. B., & Kinchin, I. M. (2006). Using concept maps to reveal conceptual typologies. *Education and Training, 48*, 127–142.

Hay, D. B., Kinchin, I. M., & Lygo-Baker. (2008). Making learning visible: The role of concept mapping in higher education. *Studies in Higher Education, 33*(3), 295–311.

Hay, D. B., Wells, H., & Kinchin, I. M. (2008). Quantitative and qualitative measures of student learning at university level. *Higher Education, 56*, 221–239.

Hay, D. B., Williams, D., Stahl, D., & Wingate, R. J. (2013). Using drawings of the brain cell to exhibit expertise in neuroscience: Exploring the boundaries of experimental culture. *Science Education, 97*(3), 468–491.

Jarvis, P. (2006). *Towards a comprehensive theory of human learning: Lifelong learning and the learning society* (vol. 1). London & New York: Routledge.

Jonassen, D. H., Reeves, T., Hong, N., Harvey, D., & Peters, K. (1997). Concept mapping as cognitive learning and assessment tools. *Journal of Interactive Learning Research, 8*, 289–308.

Kinchin, I. M. (2000). *The active use of concept mapping to promote meaningful learning in biological science*. PhD Thesis, University of Surrey.

Kinchin, I. M. (2001). If concept mapping is so helpful learning biology, why aren't we all doing it? *International Journal of Science Education, 23*(12), 1257–1269.

Kinchin, I. M. (2003). Effective teacher ↔ student dialogue: A model from biological education. *Journal of Biological Education, 37*(3) 110–113.

Kinchin, I. M. (2014). Concept mapping as a learning tool in higher education: A critical analysis of recent reviews. *The Journal of Continuing Higher Education, 62*, 39–49.

Kinchin, I. M., & Alias, M. (2005). Exploiting variations in concept map morphology as a lesson-planning tool for trainee teachers in higher education. *Journal of In-service Education, 31*(3), 569 – 592.

Kinchin, I. M., & Cabot, L. B. (2010). Reconsidering the dimension of expertise: From linear stages towards dual processing. *London Review of Education, 8*, 153–166.

Kinchin, I. M., Cabot, L. B., & Hay, D. B. (2008). Using concept mapping to locate the tacit dimension of clinical expertise: Towards a theoretical framework to support critical reflection on teaching. *Learning in Health and Social Care, 7*, 93–104.

Kinchin, I. M., Chadha, D., & Kokotailo, P. (2008). Using PowerPoint as a lens to focus on linearity in teaching. *Journal of Further and Higher Education, 32*(4), 333–346.

Kinchin, I. M., deLeij, F. A. A. M., & Hay, D. B. (2005). The evolution of a collaborative

concept mapping activity for undergraduate microbiology students. *Journal of Further and Higher Education, 29*(1), 1–14.

Kinchin, I. M., & Hay, D. B. (2005). Using concept maps to optimise the composition of collaborative student groups: A pilot study. *Journal of Advanced Nursing, 51*(2) 182–187.

Kinchin, I. M., & Hay, D. B. (2007). The myth of the research-led teacher. *Teachers and Teaching: Theory and Practice, 13*, 43–61.

Kinchin, I. M., Hay, D. B., & Adams, A. (2000). How a qualitative approach to concept maps analysis can be used to aid learning by illustrating patterns of conceptual development. *Educational Research, 42*(1), 43–57.

Kress, G. (2003). *Literacy in the new media age*. New York: Routledge.

Kress, G., & van Lueewen, T. (2006). *Reading images: The grammar of visual design*. New York: Routledge.

Latour, B. (1987). *Science in action: How to follow scientists and engineers through society*. Cambridge Massachusetts: Harvard University Press.

Lea, M., & Street, B. (1998). Student writing and staff feedback in higher education: An academic literacies approach. *Studies in Higher Education, 23*(2) 157–172.

Lui, X.. & Hinchey, M. (1996). The internal consistency of a concept mapping scoring scheme and its effect on prediction validity. *International Journal of Science Education, 18*(8), 921–937.

Marton, F., & Säljö, R. (1976). On qualitative differences in learning: I—Outcome and process. *British Journal of Educational Psychology, 46*, 4–11.

Mertz, E. (2007). *The language of the law school: Learning to "think like a lawyer"*. Oxford: Oxford University Press.

Meyer, J. H. F., & Land, R. (2003). Threshold concepts and troublesome knowledge: Linkages to ways of thinking and practising. In C. Rust (Ed.), *Improving Student Learning: Theory and Practice Ten Years On*. Oxford: Oxford Centre for Staff and Learning Development.

Novak, J. D. (1977). *A theory of education.* Itheca: Cornell University Press.

Novak, J. D. (2010). *Learning, creating, and using knowledge: Concept maps as facilitative tools in schools and corporations*. New York: Routledge.

Novak, J. D., & Gowin, D. B. (1984). *Learning how to learn*. Cambridge: Cambridge University Press.

Novak, J. D., Mintzes, J. J., & Wandersee, J. H. (2000). Learning, teaching and assessment: A human constructivist perspective. In J. J. Mintzes, J. H. Wandersee, & J. D. Novak (Eds.), *Assessing Science Understanding: A Human Constructivist View* (pp. 1–18). California: Elsevier.

Novak, J. D., & Musonda, D. (1991). A twelve-year longitudinal study of science concept learning. *American Educational Research Journal, 28*(1), 117–153.

Ruiz-Primo, M. A., & Shavelson, R. J. (1996). Problems and issues in the use of concept maps in science assessment. *Journal of Research in Science Teaching, 33*(6), 569–600.

Shavelson, R. J., Ruiz-Primo, M. A., & Wiley, E. W. (2005). Windows into the mind. *Higher Education, 49*, 413–430.